

LOLIOLUS RHOMBOIDALIS, A NEW SPECIES OF LOLIGINID SQUID FROM THE INDIAN OCEAN¹

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ABSTRACT

A new species of loliginid squid, *Loliolus rhomboidalis* from the Indian Ocean is described. The similarities and differences between the present species and three other known species of the genus *Loliolus* from the same area are discussed.

INTRODUCTION

During the course of the study of the cephalopods collected from the Indian Ocean by the R/V ANTON BRUUN (Cruise I and Cruise A), eight specimens of small but mature loliginid squids were found. Upon closer examination, seven specimens were found to belong to a new species of the genus *Loliolus* Steenstrup, 1856. Although the cephalopods obtained by the R/V ANTON BRUUN in the course of American participation in the International Indian Ocean Expedition will be reported fully later, the new species described here belong to an unusual and little-known genus of considerable interest to teuthologists.

I wish to thank Dr. Gilbert L. Voss, of the Institute of Marine Science, University of Miami, for suggesting the study of part of the Indian Ocean cephalopods received from the Smithsonian Oceanographic Sorting Center and I am most grateful for the use of his personal cephalopod library and for his guidance and interest in this study. I am indebted to Mrs. Beatrice L. Burch, Assistant Supervisor for Invertebrates of the Smithsonian Oceanographic Sorting Center for providing the station data for the R/V ANTON BRUUN cruises.

Loliolus rhomboidalis, new species

Figures 1-10

Material.—HOLOTYPE: 1 adult male, mantle length 41 mm, ANTON BRUUN Sta. 47B, 19°50'N, 92°32'E, 22-23 meters, 5 April 1963. PARATYPES: 1 female, mantle length 44 mm, ANTON BRUUN Sta. 47B, 19°50'N, 92°32'E, 22-23 meters, 5 April 1963; 1 female, mantle length 43 mm, 2 males, mantle length 37-43 mm, ANTON BRUUN Sta. 46, 21°00'N, 91°59'E, 0-25 meters, 5 April 1963; 2 males, mantle length 41-47 mm, ANTON BRUUN Sta. 37, 13°28'N, 97°19'E, surface, 30 March 1963.

¹ Contribution No. 773 from the Institute of Marine Science, University of Miami.

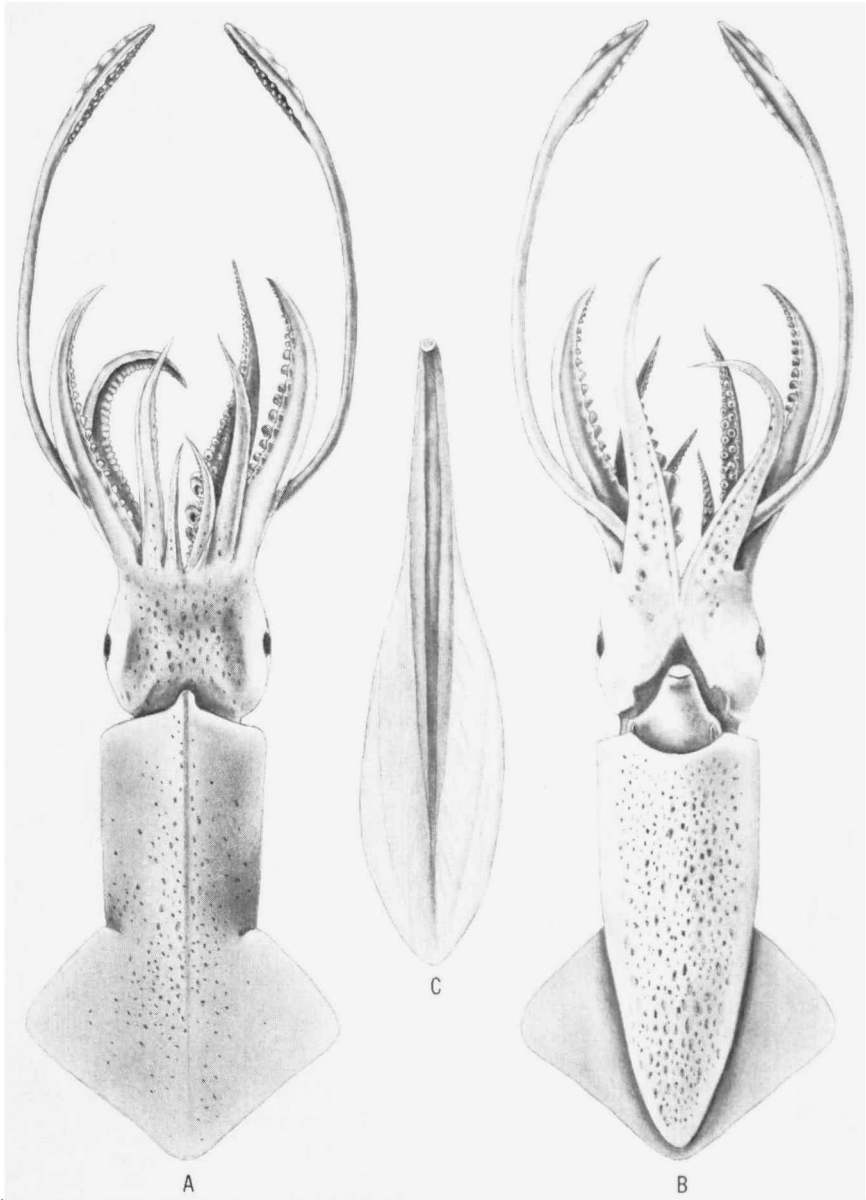


FIGURE 1. *Loliolus rhomboidalis*, n. sp. Holotype, male, mantle length 41 mm: A, Dorsal view; B, Ventral view; C, Gladius from female paratype, mantle length 44 mm.

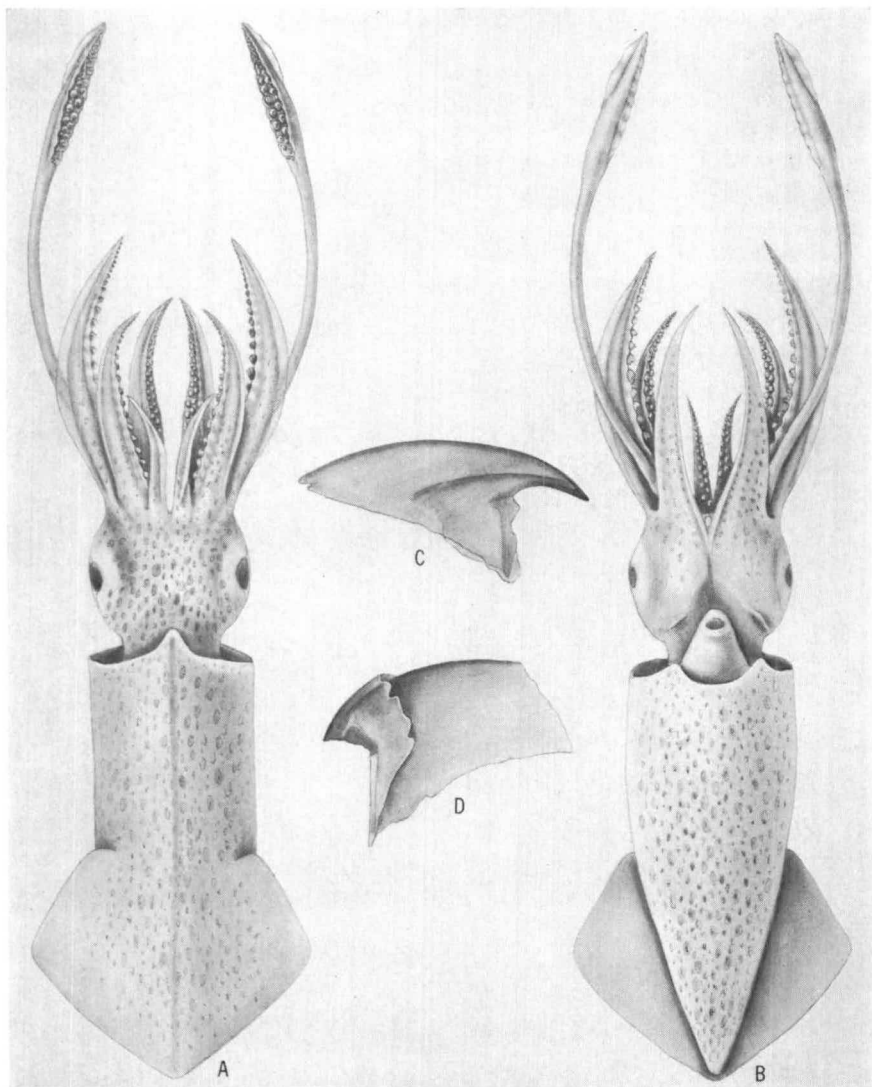


FIGURE 2. *Loliolus rhomboidalis*, n. sp. Paratype, female, mantle length 44 mm: A, Dorsal view; B, Ventral view; C and D, Upper and lower beaks.

Description.—The mantle is sub-cylindrical, slightly compressed dorso-ventrally, widest at about one-half of its length, gradually tapering posteriorly and terminating in a blunt point. The mantles of the females are slightly more pointed than those of the males. The anterior dorsal margin

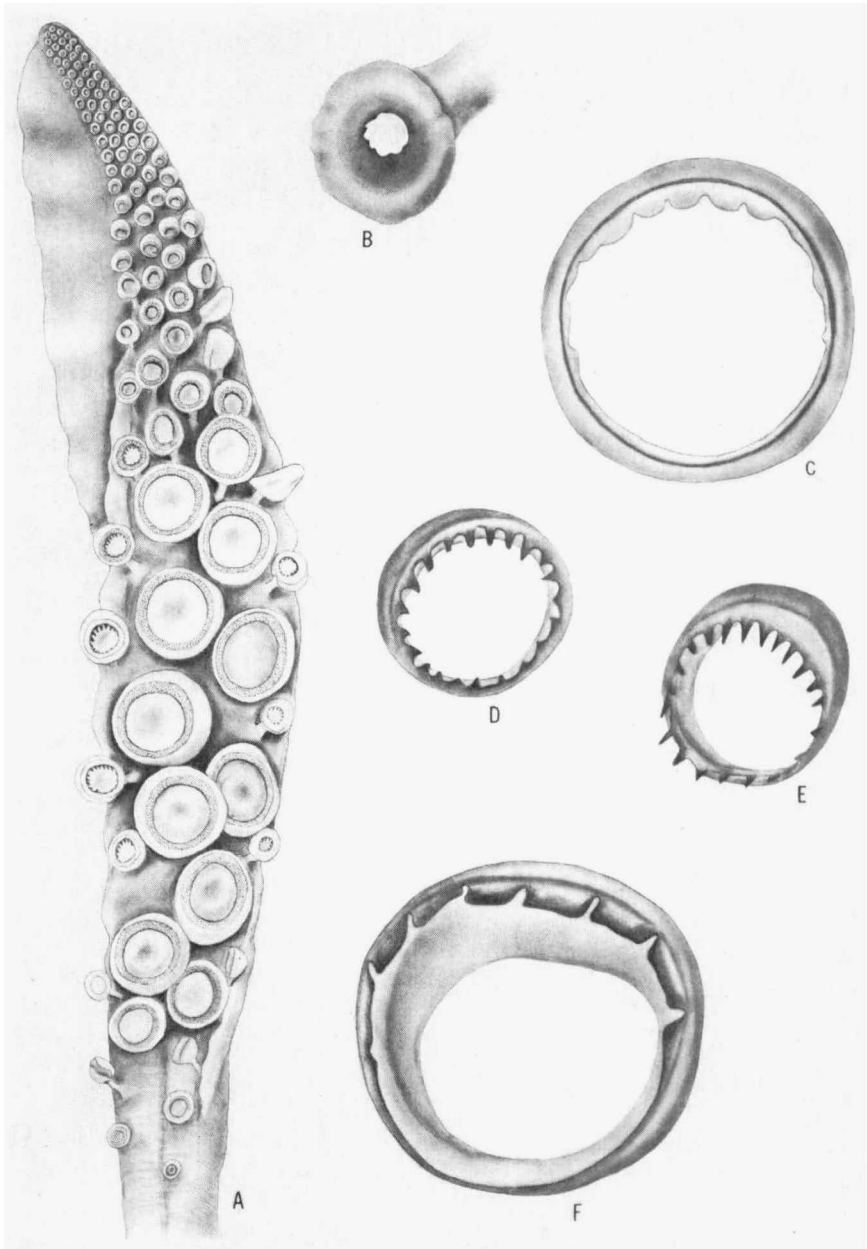


FIGURE 3. *Lolius rhomboidalis*, n. sp. Paratype, mantle length 44 mm: A, Left tentacular club; B, Sucker from buccal lappet; C, Median sucker of

TABLE 1
MEASUREMENTS (IN MM) OF THE HOLOTYPE AND SIX
PARATYPES OF *Lololus rhomboidalis* N. SP.

Sex	Holotype			Paratypes			
	M	F	F	M	M	M	M
Length of mantle	41	44	43	43	37	41	47
Width of mantle	15	15	19	19	15	17	17
Width of head	14	13	15	—	13	14	14
Length of fin	20	23	19	24	21	21	25
Width of fin	28	26	—	28	26	28	30
1st right arm	13	10	14	15	11	12	16
1st left arm	16	11	14	16	11	13	14
2nd right arm	19	15	21	25	19	21	25
2nd left arm	19	16	—	22	19	20	23
3rd right arm	22	20	28	30	22	26	35
3rd left arm	25	20	24	31	24	24	—
4th right arm	25	21	24	28	21	24	34
4th left arm	22	22	22	24	18	22	25
Right tentacle	51	42	56	55	40	65	66
Left tentacle	51	45	53	60	50	55	68
Right tentacular club	17	17	16	20	13	18	18
Left tentacular club	16	17	15	20	15	17	18
Diameter of largest sessile arm sucker	1.2	1.1	1.0	1.3	1.1	1.3	1.4
Diameter of largest tentacular sucker	1.2	1.2	1.3	1.4	1.0	1.5	1.1

of the mantle is produced into a blunt triangular projection. Ventrally, the mantle edge is emarginated beneath the funnel, with distinct angles on each side.

The fins are large, rhombic in form with straight anterior and posterior margins, slightly rounded laterally and united a little beyond the tip of the mantle. The fin length is about 50 per cent of the mantle length and the fin width is about 66 per cent of the mantle length. There are no apparent differences between the sexes in the relative proportions and characteristics of the mantles and fins.

The head is small, narrower than the mantle width. It is almost as long as it is wide, dorso-ventrally compressed, and concave ventrally. The eyes are fairly large and not protruding.

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club; D, Marginal sucker of club; E, Median distal sucker of club; F, Sucker from left second arm.

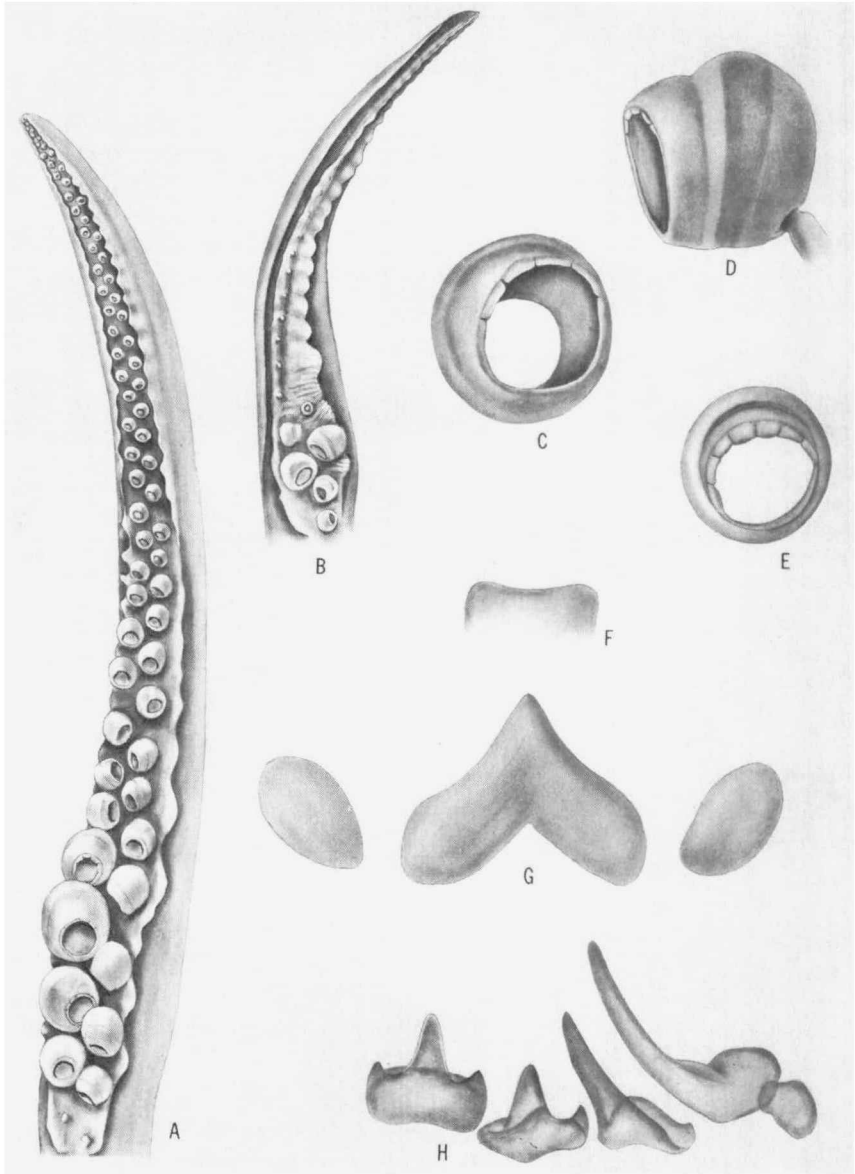


FIGURE 4. *Loliolus rhomboidalis*, n. sp. Holotype, mantle length 41 mm. A, Right ventral arm; B, Left ventral arm; C and D, Globular suckers from right ventral arm; E, Unmodified sucker from left ventral arm.—Paratype, mantle length, 44 mm: F, Valve; G, Funnel organ; H, Third row of teeth of radula.

The mantle-funnel locking apparatus is simple, only slightly sinuous, its anterior half more heavily chitinized than the posterior half. The olfactory crest is not very prominent and bears a small pore located between the eye and the base of the third arm.

The funnel is stout and free in its anterior third. The funnel organ is large. The dorsal element is shaped with broad rounded limbs. The ventral pads are large and broadly oval. The valve is subterminal, squarish, with rounded edges.

The arms are of moderate length, somewhat shorter than the mantle. The predominant arm order is 3.4.2.1. The females have slightly shorter arms than the males. Arm I is the shortest, laterally compressed with a distinct aboral keel and narrow protective membranes. Arm II is squarish proximally but becomes compressed distally. There is a distinct keel aborally and the protective membranes are narrow. Arm III is flattened, broad, with a developed but not unusually wide swimming keel. The protective membrane is wider ventrally. Arm IV is flattened aborally with a distinct ventral ridge and with a fairly well developed tentacular sheath on the dorsal side. The protective membranes are narrow. All of the arms possess biserial suckers. Arm III bears the largest suckers in both sexes. The arm suckers of the males are larger than those of the females.

Several unusually enlarged globular suckers are present on the right ventral arms of the males. The first five pairs of suckers are globular, gradually increasing in size, the fourth pair being the largest of all. Except for these unusually enlarged globular suckers, the shape of the suckers of both males and females are similar. The horny rings of both the globular and regular suckers are similar, generally with six large square teeth on the distal half and fairly smooth on the proximal half. The horny rings of the globular suckers are not wider than the horny ring of the largest arm sucker, but it is much thicker and provided with only four square teeth.

The left ventral arm of the male is hectocotylized. It is shorter than the right ventral arm. There are 6-7 unmodified suckers on the proximal portion which are not different from the normal suckers of the other arms. The remaining suckers are modified. The outer row is reduced to papilla-like stumps that decrease in size distally. The dorsal protective membrane may conceal some of the papillae, especially the very small ones on the distal part of the arm. The inner row of suckers is represented by a series of broad thickenings (28 or more) close to one another, palisade-like, which also gradually become reduced in height distally. The most proximal thickening is about 0.5 mm in width. The swimming membrane is fairly broad and slightly thickened.

The tentacles are moderate in length, slender, not exceeding the mantle length by more than $1\frac{1}{2}$ times. The clubs are slender and the swimming keel extends to about $\frac{3}{4}$ of the club length. The dorsal and ventral

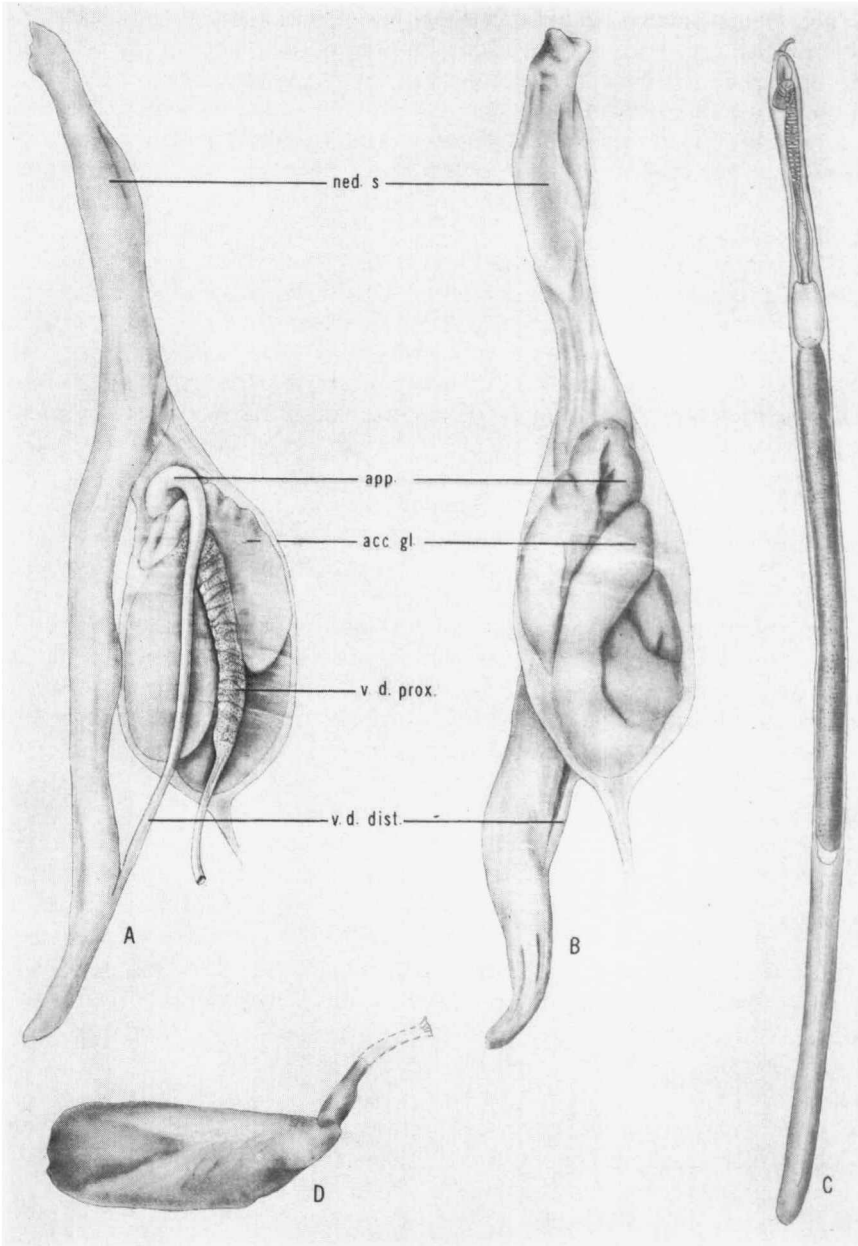


FIGURE 5. *Lolius rhomboidalis*, n. sp. Paratype, mantle length 41 mm: A and B, Dorsal and ventral views of the male reproductive systems; C,

trabeculate protective membranes are not especially wide and disappear at about the first pair of marginal suckers. The club suckers are quadriserial, the first six pairs of median suckers are much enlarged, about twice the size of the corresponding marginal suckers. The suckers distal to the sixth pair of median suckers are approximately the same dimensions and gradually become smaller toward the apex of the club. The median suckers are flattened, disc-shaped. The horny rings are thin, with indistinct square teeth distally but with an irregular border proximally. The small median suckers have about 21 acute teeth distributed around the margin of the horny ring. The horny rings of the marginal suckers are similar to the small median suckers except for a slight reduction in the number of teeth (19 instead of 21).

The buccal membrane is provided with seven lappets each bearing about 2-4 small suckers. The females possess a spermatophore pad below the lower lobe of the buccal membrane.

The gladius is thin and fragile; the midrib is well developed, with a broad vane widest in the posterior third.

The mandibles are fragile with the biting edges well pigmented. The rostrum of the upper beak is very pointed and there is a blunt tooth below the notch. The lower beak is stronger and its pigmented portion broader.

The radula is typical of the group. All the teeth have blunt cusps; the lateral is sabre-shaped and much longer than the others.

The ink sac is elongate, about 7 mm in length and 2 mm in width.

The female has well developed nidamental glands and the eggs in the ovaries are less than 2 mm in length.

The male reproductive system resembles that of *Loliolus typus* Steenstrup as figured by Grimpe (1932, text fig. 7). The spermatophores are small, 2.4 mm in total length, and possess no distinctive features.

The color of the better-preserved specimens is a pale yellowish-brown color with purplish-red chromatophores. The chromatophores are diffused without any distinctive pattern.

Holotype.—USNM.

Type Locality.—19°50'N, 92°32'E, 22-23 meters, ANTON BRUUN Sta. 47B.

Distribution.—Indian Ocean, Bay of Bengal, Andaman Sea.

Discussion.—Three species of the genus *Loliolus* are known from the Indian Ocean, namely: *Loliolus affinis* Steenstrup, 1856, *L. typus* Steen-

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Spermatophore; D, Ink sac. Lettering: ned. s., needhams sac; app., appendix; acc. gl., accessory gland; v.d. prox., vas deferens (proximal); v.d. dist., vas deferens (distal).

strup, 1856, and *L. investigatoris* Goodrich, 1896. *Loliolus investigatoris* has been described adequately by Goodrich (1896), Massy (1916), and Adam (1939, 1954). Unfortunately there is no full description of *L. affinis* but Adam (1954) is of the opinion that it and *L. investigatoris* are probably identical. *Loliolus typus* was likewise insufficiently described originally, but in 1932 Grimpe redescribed the species from 13 specimens (6 males and 7 females) which were collected from Panaroekan, East Java, and Soerabaya.

Loliolus rhomboidalis has certain distinct characters which adequately distinguish it from other known species of *Loliolus* and immature loliginids.

The fins of the new species are rhombic in form in contrast with the heart-shaped fins of the three previously known species.

In all four species the left ventral arms are modified in almost the same manner except for the presence of 6-7 unmodified suckers on the proximal part of the arm in *L. rhomboidalis*. These suckers are absent in the other species although Adam (1939, p. 67) noted the presence of one basal sucker in a male specimen of *L. investigatoris*. *Loliolus investigatoris* has 29-32 modified suckers forming the ventral ridge of the hectocotylus, *L. typus* has 26, *L. affinis* has 20, and the present species about 28 or more. Adam (1954) noted that *L. typus* as seen from Grimpe's diagram (1932, Pl. 12, Fig. 3) does not possess an extremely developed protective membrane on the hectocotylized arm. Both *L. investigatoris* and *L. rhomboidalis* have wide protective membranes on the dorsal side capable of covering the papilla-like modified suckers.

The most distinctive character of *L. rhomboidalis* is the presence of several large globular suckers on the right ventral arm of the male. Their apertures are no wider than the other arm suckers but the sucker itself is much larger, globular rather than cup-like.

Both *L. investigatoris* and *L. rhomboidalis* have similar mandibles with a small projection or tooth at the base of the notch of the upper mandible. The upper mandible of *L. typus* is of an unusual and peculiar shape (Grimpe, 1932, text fig. 2). The radulae of all these species are very similar except for the slightly more elongated cusp of the lateral tooth in *L. rhomboidalis*.

The specific name *rhomboidalis*, referring to the rhombic fins, was chosen in order to draw attention to the most distinctive feature separating this species from the other members of the genus.

SUMARIO

Loliolus rhomboidalis, UNA NUEVA ESPECIE DE CALAMAR LOLIGINIDO DEL OCÉANO ÍNDICO

Se describe *Loliolus rhomboidalis* basándose en siete ejemplares colectados por el barco de investigaciones ANTON BRUUN, en el Océano Índico

en 1963. Esta especie se diferencia de otras tres especies de *Loliolus* del Océano Índico por tener: aletas rómbicas, el brazo ventral izquierdo del macho muy modificado pero con seis o siete ventosas no modificadas situadas en la porción proximal del mismo brazo y ventosas globulares grandes poco usuales en el brazo ventral derecho del macho.

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